**C:\Users\Jenn15\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\G4GIRNJJ\MC900413302[1].wmfNEWTON’S THIRD LAW PROJECT**

**“NEWTON’S SCOOTER”**

**100 POINTS = TEST GRADE**

**DUE DATE**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**LAB PARTNERS**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Science is a collaborative process. Scientists, like people in any other profession, rarely work alone. This project will require you to have a partner, of your choice, with whom you will work on this project. You and your partner will build a vehicle; however, you will each have to type your own individual lab report.

**PURPOSE**: To design and construct a vehicle that is powered only through Newton's Third Law of Motion. You have learned how Newton's Three Laws of Motion govern the relationship of forces and motion. *You will use Newton's Third Law to build a vehicle.*

**YOUR VEHICLE MUST**:

* Be handmade! No store bought, already constructed vehicles.
* Move forward by pushing back on something (Newton's 3rd Law). You may not be the one that supplies the force.
* Cannot be powered by *any form* of electricity or use gravity in order to move (no downhill slopes allowed on this one)
* Travel a minimum distance of 150 cm in a straight line (definitely no more than 100 cm path width)
* Upon completion, you must demonstrate your Newton vehicle and complete an *individual, typed* lab write-up.
* Should be within a size that is easily transportable to and from school for project work.

**TO GET STARTED**:

* *Brainstorm:* Think of possible designs for your vehicle but be careful not to lock yourself into a single idea. Remember that a car with wheels is only one type of vehicle. Ask friends and family members for ideas and suggestions. The internet is full of suggestions; make sure you research there as well. Try to think of ways to recycle household materials to build your vehicle.
* *Sharing of ideas:* On day one you will first share ideas with your group. Members of your group will consult a member from another group and share ideas. Return to your own group, share any new ideas and come up with a plan for your group's vehicle. Decide on construction materials and who will bring what items.

**HINTS TO HELP YOU**:

* *Suggested Supplies.* You may not use a premade car or a vehicle that you already made for another project! Some ideas are recycled materials from home; balloons, springs, toys or building-block sets (legos, k’nex, tinker toys), fishing lines, paper towel rolls, straws, etc.
* *The vehicle for your project will need to accelerate from a resting position.* From Newton's Second Law of Motion, you know that Force = mass x acceleration or Acceleration = Force/mass. This means you have two ways of increasing acceleration: increasing force or decreasing mass. How can you either increase the force acting on your vehicle or decrease its mass?
* *Draw a diagram of your vehicle.* Use labeled arrows to show each place that a force is acting on it. Be sure to include friction forces in your diagram. Brainstorm ways to reduce forces that slow down your vehicle. If you have access, you may want to consider using a “track” such as a toy car track to help guide your vehicle within the boundaries and reduce friction.
* *Construct your vehicle*. Is your vehicle powered according to Newton's Third Law of Motion? Add to your diagram so that it shows the force exerted by your vehicle and the force exerted on your vehicle to make it move. What exerts the force that moves your vehicle? Be ready to explain the diagram to other students.
* *Have you tested (****and retested!****) your vehicle to make sure it will work?* Be prepared to identify all the forces acting on the vehicle. List at least three features you included in the design of the vehicle that led to an improvement in its performance.

**DEMONSTRATION**: WORTH 60 POINTS

The demonstrations will take place in the gym. Each member of the group is **expected to participate** in the demonstration. *Determine prior to demonstration how each member will take part in the demonstration.*

* **(5)** Show off your vehicle – I will be checking out your design.
* **(25)** Put it at the starting line to determine if it travels at least 150 cm.
* **(10)** The path of the vehicle should be in a straight line, but definitely no more width than 100cm.
* **(10)** Explain all the forces acting on the vehicle.
* **(5)** Tell your classmates about design features to improve performance.
* **(5)** Confirm with your peers that your vehicle is powered by Newton's Third Law of Motion

**LAB WRITE-UP**: WORTH 40 POINTS

Each person in the group must type their own individual lab write-up. It must be in your own words! If I receive the same lab write-up from each partner, you will not be given any points and this will be considered cheating. Your lab write-up **must be typed** and is due the day of your presentation.

The following must be included in the write-up:

1. **Title (1)**: Be sure to give your lab write-up a title that applies to your project.
2. **Hypothesis (2)**: Should correspond with the purpose of the project.
3. **Materials (3)**: List everything that would be needed to repeat this experiment.
4. **Procedure (4)**: Write out the steps of your procedure *carefully*. Someone else should be able to follow your procedure to construct a Newton vehicle like yours.
5. **Data (5)**: Your data should include a **diagram** of your vehicle showing all the forces affecting it.
6. **Questions (5/question=15)**: Include answers to the following questions in your lab write up. You must answer the questions using complete sentences and thorough explanations.
7. Did your vehicle move forward by pushing back on something? Explain your answer.
8. Was your vehicle powered by Newton's Third Law of Motion and not by any form of electricity or gravity? Explain your answer.
9. Did your vehicle travel a minimum of 150 centimeters in a straight line (or with a path width less than 100cm)? Why or why not? *(I should see words like mass, acceleration, inertia and force in this explanation.)*
10. **Conclusion (10)**: Remember! Your first sentence of your conclusion should connect with your hypothesis. Your explanation should explain how you know that your first sentence (hypothesis) is true.

**BE CREATIVE AND HAVE FUN!!**

**All vehicles will be entered into a contest for prizes!**

CATEGORIES:

Fastest/Greatest Acceleration

Greatest Distance Traveled

Strongest/Best Presentation of Force

Straightest Path

Most Eco-Friendly Vehicle

And the Newton Award for the vehicle that best personifies the highest from ALL of Newton’s Laws at its finest!